Homework Section 14.1

1. The temperature-humidity index I gives the perceived air temperature as a function of the actual temperature T and the relative humidity h. So I can be written as $I = f(T,h)$. The following table represents I on a restricted domain.

Relative Humidity (%)

Actual Temperature (°F) T \ h	**20**	**30**	**40**	**50**	**60**	**70**
80	77	78	79	81	82	83
85	82	84	86	88	90	93
90	87	90	93	96	100	106
95	93	96	101	107	114	124
100	99	104	110	120	132	144

   a) What is the value of $f(85,30)$. What does it mean?
   b) For what value of T is $f(T,50) = 107$?
   c) What is the meaning of the function $f(T,50)$?
   d) Consider the function $f(85,h)$. What happens as the humidity increases?

2. Consider the function $f(x,y) = \ln(x^2 + 4y^2 - 16)$.
   a) Evaluate $f(3,-4)$
   b) Find and sketch the domain of *f*.
   c) Find the range of *f*.

3. Find and sketch the domain of $f(x,y) = \dfrac{xy}{1-x^2}$.

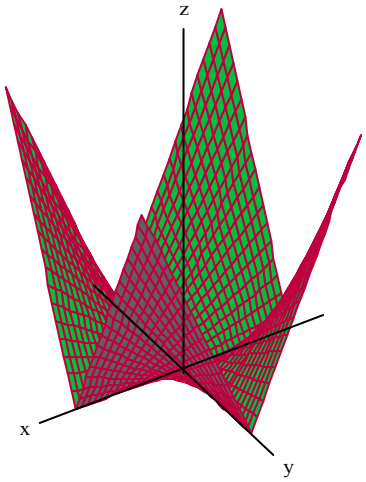
4. Consider the function $f(x,y,z) = e^{\sqrt{z-x^2-y^2}}$.
   a) Evaluate $f(1,2,5)$
   b) Find and sketch the domain of *f*.
   c) Find the range of *f*.

5. Sketch the graph of the function

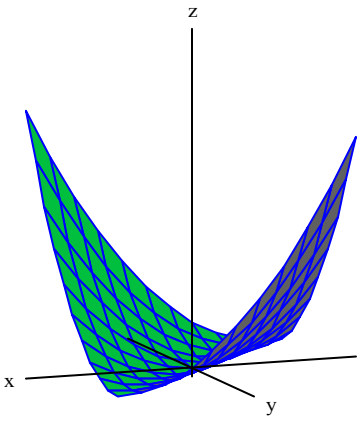
   a) $f(x,y) = x^2 + \dfrac{y^2}{4}$
   b) $f(x,y) = 6 - 2x - 3y$
   c) $f(x,y) = 2\sin x$
   d) $f(x,y) = \sqrt{16 - 4x^2 - y^2}$

6. Match each picture to one of the equations labeled I-IV.

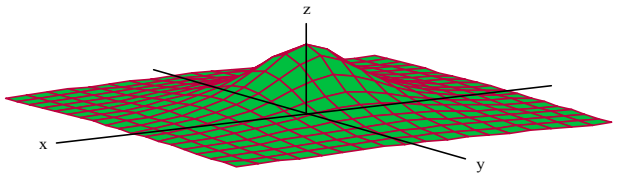
a)



b)



c)



I. $f(x,y)=(x-y)^2$

II. $f(x,y)=\sin(x+y)$

III. $f(x,y)=|xy|$

IV. $f(x,y)=\dfrac{1}{1+x^2+y^2}$

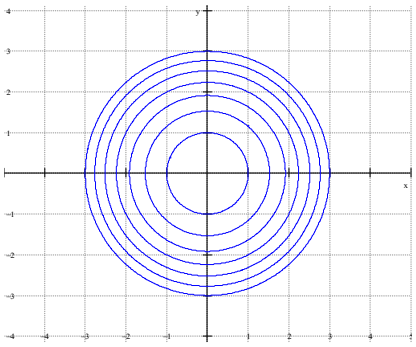
7. Draw a contour map of the function showing at least three level curves.

a) $f(x,y)=y^2-x^2$

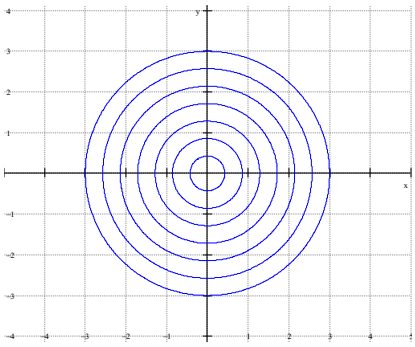
b) $f(x,y)=y+\ln x$

8. Which of the below set of level curves might represent an elliptic paraboloid? Justify your answer.

I



II



9. Graph one level surface of $f(x, y, z) = x^2 + y^2 - z^2$. Assume f(x, y, z) > 0.